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Patentanmeldung Nr. | Patent application No. | Demande de brevet n°

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PRIORITY DOCUMENT

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Blatt 2 der Bescheinigung
Sheet 2 of the certificate
Page 2 de l'attestation

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Bezeichnung der Erfindung:
Title of the invention:
Titre de l'invention:
Record carrier, device for playing back a record carrier, method for playing back a record carrier, device for recording a record carrier and a method for recording a record carrier

In Anspruch genommene Priorität(en) / Priority(ies) claimed / Priorité(s) revendiquée(s)

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Record carrier, device for playing back a record carrier, method for playing back a record carrier, device for recording a record carrier and method for recording a record carrier.

The invention pertains to a record carrier.

The invention also pertains to a device for playing back a record carrier.

The invention further pertains to a method for playing back a record carrier.

Several standards are in development for digital storage and reproduction of audiovisual data such as the SVCD and DVD standard. SVCD describes storage of audiovisual data in the form of MPEG2-files, which may be reproduced under control of a so called Play Sequence Descriptor (PSD). The audiovisual data and the PSD are stored at the record carrier. The PSD is a set of control structures that enables the playback of preprogrammed sequences with user selection and interaction. User selection may for example take place by menus which are displayed on a display device, and from which the user may select an item by pointing at a position of the display device with a pointing device such as a mouse. Reading such a menu from the record carrier may delay the interaction speed.

It is an object of the invention to provide a record carrier, a device for reproducing audiovisual data from a record carrier and a method for reproducing audiovisual data from the record carrier which allow a higher interaction speed.

To that end a record carrier of the invention comprises information organized in a plurality of files containing audio visual data and playback control data for controlling playback of the audiovisual data on a playback device while enabling user interaction, the information further comprising priority information, indicating the relative priority with which the files are to be stored in a cache memory of the playback device.

A record carrier according to the invention is particularly suitable for playback on a playback device according to the invention. A playback device according to the invention comprises read means for reading the data from a record carrier, a cache memory for storing data from the record carrier, user input means for receiving user input, control means for

processing the control data, and reproduction means for reproducing the audio visual data, the device being adapted to read priority information and to store files into the cache memory with a priority determined by this priority information.

Preferably the priority information (priority) is related to an estimated frequency with which the said data is accessed. The priority information enables the playback device to store frequently accessed control data in its cache memory, while keeping less frequently accessed files at the record carrier. Such control data comprises for example menu items. This type of data is often used to request information from a user how to proceed with the playback. Loading such a menu item from the record carrier may take one or two seconds and therewith hampers the speed of interaction between the playback device and the user. By providing the priority information at the record carrier a playback device according to the invention is enabled to store this type of data in a cache memory and to therewith improve the interaction speed. The cache memory may be relatively small as the priority information indicates which information is the most relevant to store therein. The priority information preferably discerns at least 8 levels. This enables a playback device having only a relatively small cache memory to select only the most frequently accessed files for storage in the cache memory. If on the other hand such a record carrier is played back at a playback device having a greater cache memory, in addition to those files other files may be stored in the cache memory which are less frequently accessed, but still important.

It is possible to attach each item of priority information to the file to which it corresponds. Preferably however, the priority information is contained in a single file. This allows a playback device to retrieve the priority information with one file access.

An attractive embodiment of the playback device according to the invention is characterized by means for rewriting the priority information at the record carrier in accordance with the frequency with which the files are actually accessed by a user. This allows the playback device to adapt the record carrier to the profile of a particular user.

The invention also provides a method for playback of a record carrier comprising information organized in a plurality of files containing audiovisual data and playback control data for controlling playback of the audiovisual data while enabling user interaction, which method comprises the steps of

a. determining whether a cache memory does have sufficient unoccupied space,

aa. if it is determined that the cache memory does not have sufficient unoccupied space, then determining whether the cache memory does have space sufficiently large which is

occupied by one or more further data files having a priority value lower than the priority value of the first data file,

aaa. if the outcome of step aa is true, then overwriting said one or more further data files by the first data file.

A preferred embodiment of said method is characterised in that if the outcome of step a is true then

ab it is determined whether the first data file has a priority value higher than a predetermined value,

aba if the outcome of step ab is true then the first data unit is loaded from the record carrier into the cache memory.

The advantage of this embodiment is that it is prevented that files having a too low priority would be loaded into the cache memory. Such files generally would only stay relatively short into the cache memory as they would be overwritten by files having a higher priority.

The cache memory of a playback device according to the invention may also be loaded during an initialisation stage of the device by means of the following method for playback of a record carrier comprising information organized in a plurality of files containing audiovisual data and playback control data for controlling playback of the audiovisual data while enabling user interaction, which method comprises a procedure for loading files in a cache memory comprising the steps of

d setting a reference priority value,

e for a plurality of files examining whether a priority value assigned thereto is higher than the reference priority value,

ea if the outcome of step e is true examining whether the cache memory comprises sufficient space for storing the said data unit,

eaa if the outcome of step ea is true then loading said data unit into said space,

f reducing the reference priority value,

g determining whether the reference priority value is greater than or equal to a bottom priority value,

ga repeating steps d to g if the outcome of step g is true.

A record carrier according to the invention may be recorded with a device for recording a record carrier comprising information organized in a plurality of files containing audio visual data and playback control data for controlling playback of the audiovisual data on

a playback device while enabling user interaction, the information further comprising priority information, indicating the relative priority with which the files are to be stored in a cache memory of the playback device,

the playback device comprising

- means for obtaining the audiovisual data,
- means for composing the control data,
- priority determining means for determining the priority information,
- formatting means for formatting the audiovisual data and the control data into files,
- recording means for recording the information comprising the priority information, the audiovisual data and the control data at the record carrier.

A record carrier according to the invention may be recorded with a method for recording a record carrier comprising information organized in a plurality of files containing audio visual data and playback control data for controlling playback of the audiovisual data on a playback device while enabling user interaction, the information further comprising priority information, indicating the relative priority with which the files are to be stored in a cache memory of the playback device,

the method comprising the steps of

- obtaining the audiovisual data,
- composing the control data,
- determining the priority information,
- formatting the audiovisual data and the control data into files,
- storing the information comprising the priority information, the audiovisual data and the control data at the record carrier.

The playback control program may be recorded at the same information carrier together with the audiovisual data, but may otherwise be stored at a separate record carrier or in a ROM of the playbackdevice.

These and other aspects of the invention are described in more detail with reference to the drawing and with reference to an appendix: "Specification Proposal for a Video Disc Play Control Program (PCP)" which is incorporated by reference herein. In the drawing:

Figure 1 shows an embodiment of a record carrier according to the invention,

Figure 2 shows an embodiment of a device according to the invention,

Figure 3 shows an embodiment of a method according to the invention,

Figure 4 shows relations between several aspects of the invention,

Figure 5 shows a further embodiment of a method according to the invention.

Figure 1 shows a record carrier 1 which comprises information organized in a plurality of files 2 containing audiovisual data 11 and playback control data 12 for interactively controlling reproduction of the audiovisual data 11 on a playback device. The playback control data on the one hand controls playback of the audiovisual data and on the other hand allows for user interaction, for example by providing options from which the user can choose. In the embodiment disclosed here the files have a file structure as described in section 3 of the appendix. Part of the file structure is a file header (File_header) containing a file identification (File_ID). In an embodiment the audiovisual data maybe contained in one or more of the following four types of MPEG files. The first type is an MPEG movie file (File_ID = 10). This type of file contains a video stream, one or more audio streams and a private stream. A second type of file is an MPEG audio file (File_ID = 11). This type of file contains one or more audio streams, but no video stream. A third type of file is an MPEG picture file (File_ID = 12). It contains a video stream with one or more still pictures, but no audio stream. A fourth type of MPEG file (File_ID = 13), a so called MPEG show file comprising a video stream with one or more still pictures and one or more audio streams. Further the audiovisual data may comprise JPEG picture files (File_ID = 20) and bitmap image files denoted as BMP in the Figure (File_ID = 21). The playback control data 12 comprises one or more so called Play Control Program files (PCP, File_ID = 3), which may include a PCP-file for startup. Each PCP-file may contain one or more functional blocks FB. An FB on its turn contains one or more commands CMD1, ... CMDn, as described in section 4.5 of the appendix. Further the playback control data comprises a Play Item Table file (PIT-file, File_ID = 2). The structure of the PCP-file is described in detail in section 3.2 and the PIT-file is described in section 3.3 of the appendix. Furthermore the record carrier comprises a File Record Table file (FRT-file, File_ID = 1) as described in section 3.1 of the appendix. The FRT-file comprises information about all files at the record carrier 1, such as their size and address at the record carrier as well as general information about the record carrier. The record carrier is preferably a medium which is randomly accessible, such as a disc, as described in the appendix, or a card. The medium is for example an optical, a magnetic or a magneto-optical

medium. The information at the record carrier 1 further comprises priority information, indicating the relative priority with which the files 2 are to be stored in a cache memory of the playback device.

In the embodiment described here the priority information is contained in a single file, in this case the FRT-file. For each of the files 2, including itself, the FRT-file comprises an entry denoted as "priority" which has a value in the range of 0 to 15. The priority information is related to the estimated frequency with which the said data is accessed. A high value of priority represents a high estimated frequency. In the embodiment described here the control data is comprised in one or more control programs, the PCP-files which comprise references to menus, e.g. in the form of MPEG picture files. Preferably those files have a high priority, preferably the highest value (15).

Figure 2 shows a playback device according to the invention for playback of the record carrier 1 described above with reference to Figure 1. The playback device comprises read means 20 for reading the data from the record carrier 1. The read means 20 are provided with control means 21 to control the reading of data from the record carrier 1 upon instructions by processing means 30 for processing the control data. The data read from the record carrier 1 is transmitted via a bus 15. The device further comprises a cache memory 39 for storing data from the record carrier 1. In addition the device has a process memory 31 for storing data which is being used by the processing means 30. The device also comprises user input means 40, 41 for enabling user interaction. The user input means are for example a keyboard or a pointing device such as a mouse. The processing means 30 interactively select audiovisual data from the record carrier 1 and have these reproduced by audio reproduction means 53, 54 comprising an MPEG-audio decoder 53 and video reproduction means 51, 52 comprising an MPEG-video decoder 51. The device according to the invention is adapted to read priority information and to store files in the cache memory 39 in accordance with this priority information. To this end the device reads the priority information from the FRT-file and if the cache memory 39 is too small to store all files, the device stores those files in the cache memory 39 which have the highest priority value. The processing means 30 comprise interpreter means 32 for interpreting commands CMD1, ... in the functional blocks FB of the play control program file PCP. The interpreter 32 sequentially interprets the commands and writes/reads a plurality of Player API registers, also denoted as Registers, which function as an application programmers interface. These Registers and their function are described in section 4.3.2 of the appendix. For example upto 16 hotspot areas may be defined by writing the Registers 128-191. A next PCP-file may be selected by writing its file number in the Register

numbered 226. A play_item, for example an MPEG file may be selected by writing an identification of said item in Register 228. Note that most Registers correspond to a separate register for writing and for reading. By reading a Register status information returned by the executing means 34 may be retrieved. For example, if the Register numbered 228 is read a so called play event ID value may be retrieved. The latter indicates a cause for ending the playback of the MPEG-file. A more detailed description is given in section 4.4.6 of the appendix. The interpreting means and executing means of the processing means may be incorporated in software on a single processor or may be implemented as different processors. The mutual relation of the different files is shown in Figure 4. When a file number of a PCP-file is written in register 226, the execution means 34 retrieve the file address of said PCP-file form the FRT-file. If this file is not already available in the cache memory 39, it is loaded from the record carrier 1 into the process memory 31. If the Play Control Program file writes an identification of a Play-item in the register 228, control is passed to the execution means 34. These look up the corresponding filenumber of an audiovisual file and the entry point within said file in the Play Item Table PIT and have said play-item reproduced. The file address of said audio visual file is retrieved from its file number by means of the FRT-file. If control is passed to the execution means 34 then operation of the interpreting means 32 is suspended until an event is detected by event handler means 35. The event handler means 35 may detect at least one of the following events, the expiration of a time interval, an input by a user, the occurrence of trigger data in the audiovisual data. This is illustrated in Figure 1 of the appendix. A command set Timer, by writing a value to Register 252, has the effect that a timer 35 starts to count down from said value and that a timer event occurs if count down is completed. A trigger event occurs if a trigger detector 37 detects that trigger_data corresponding to a trigger_mask loaded in Register 249 occur in an MPEG stream which is read from the currently selected file. A user may cause an event in several ways. In the first place one or more hot spots may be defined by writing a selection or all of the registers 128 to 191. If the user points to a hotspot, a hotspot event occurs. Otherwise a userkey event occurs if a key is pressed which is enabled by the userkey_mask. The latter is assigned to Register 250. If the reproduction of the MPEG file is completed likewise an event, End_of_File event, occurs. If an event occurs the event handler means 35 enable the interpreter means 32 to continue the interpretation with a command (Command #n+1) succeeding the command (#n) at which the operation of the interpreter means 32 was suspended.

If a file is accessed, the procedure illustrated in Figure 3 is followed. First in step S1 it is examined whether the file to be accessed is already in the cache memory 39. If

this is the case, then in step S2 the file is copied from the cache memory 39 into the process memory 31. Subsequently the file can be processed in step S3. If the file to be accessed is not available in the cache memory 39 then it is loaded from the record carrier 1 into the process memory 31 in step S4. Next it is examined in step S5 whether in the cache memory 39 enough free space is available to store the file. If the outcome is positive the file is copied from the process memory 31 into the free space of the cache memory 39 in step S7.If the outcome of the examination in step S5 is negative the program step S6 is executed. Therein it is examined whether enough space in the cache memory 39 is available which is occupied by files having a lower priority than the file which was accessed. If this is the case than that file is copied from process memory 31 into the said space in the cache memory 39 (step S7). Otherwise the said file is not copied into the cache memory 39.

An embodiment of the device according to the invention also includes a procedure for loading the cache memory 39 during initialization. Such a procedure is described with reference to Figure 5. In a first program step S10 a priority reference value PR is initialized at 15. In a second program step S11 a filenumber I is initialized at 1. Next in step S12 it is examined whether the file with file number I has a priority equal to PR. If this is not the case than the procedure continues with step S15. Otherwise the procedure continues with step S13 wherein it is examined whether the size of the file with filenumber I is less or equal than the free space in the cache memory 39. If this is true than said file is loaded into the cache memory 39 in step S14. If it is not true than the procedure continues with step S15, wherein the filenumber is increased by 1. Subsequently in step S16 it is examined whether the filenumber is less or equal than the total number of files. If this is true than the procedure continues with step S12. If this is not true than the priority reference value is decreased by one in step S17. Subsequently it is examined whether the new priority reference value is greater than or equal to 0 in step S18. If this is true than the procedure continues with step S11. If it is false then the procedure is completed.

It is remarked that the scope of protection of the invention is not restricted to the embodiments described herein. For example, while an embodiment of the apparatus according to the invention is described which comprises detection means to detect which type of record carrier is present, an other embodiment comprises input means which enable a user to provide that information. The apparatus may comprise recording means for recording an information stream on the record carrier in addition to the reading means. Neither is the scope of protection restricted by the reference numerals included in the claims. The word 'comprising' does not exclude other parts than those mentioned in a claim. The word 'a(n)'

preceding an element does not exclude a plurality of those elements. The invention further resides in each new feature or combination of features.

CLAIMS:

1. Record carrier (1) comprising information organized in a plurality of files containing audio visual data (11) and playback control data (12) for controlling playback of the audiovisual data on a playback device while enabling user interaction, the information further comprising priority information (priority), indicating the relative priority with which the files are to be stored in a cache memory (39) of the playback device.

2. Record carrier according to claim 1, characterized in that the priority information (priority) is contained in a single file (FRT).

3. Record carrier according to claim 1, characterised in that the priority information (priority) is related to an estimated frequency with which the said data is accessed.

4. Record carrier according to claim 1, characterised in that the control data is comprised in a control program (PCP) which comprises references to menus, and that the data representing the control program and the menus has a relatively high priority.

5. Playback device for playback of a record carrier (1) comprising information organized in a plurality of files containing audiovisual data (11) and playback control data (12) for controlling playback of the audiovisual data while enabling user interaction, the playback device comprising read means (20) for reading the data from a record carrier, a cache memory (39) for storing data from the record carrier, user input means (40,41) for receiving user input, control means (30) for processing the control data, and reproduction means (51-54) for reproducing the audio visual data, the device being adapted to read priority information (priority) and to store files into the cache memory with a priority determined by this priority information.

6. Playback device according to claim 5, characterized by means for rewriting the priority information at the record carrier in accordance with the frequency with which the files are actually accessed by a user.

7. Method for playback of a record carrier (1) comprising information organized in a plurality of files containing audiovisual data and playback control data for controlling playback of the audiovisual data while enabling user interaction, which method comprises the steps of

a. determining whether a cache memory (39) does have sufficient unoccupied space (S5),

aa. if it is determined that the cache memory (39) does not have sufficient unoccupied space, then determining whether the cache memory does have space sufficiently large which is occupied by one or more further data files having a priority value lower than the priority value of the first data file (S6),

aaa. if the outcome of step aa is true, then overwriting said one or more further data files by the first data file (S7),

8. Method for playback according to claim 7, characterised in that if the outcome of step a is true then

ab determining whether the first data file has a priority value higher than a predetermined value,

aba if the outcome of step ab is true then loading the first data unit from the record carrier into the cache memory,

9. Method for playback of a record carrier comprising information organized in a plurality of files containing audiovisual data and playback control data for controlling playback of the audiovisual data while enabling user interaction, which method comprises a procedure for loading files in a cache memory comprising the steps of

d setting a reference priority value (PR),(step S10),

e for a plurality of files examining whether a priority value assigned thereto is higher than the reference priority value (step S12)

ea if the outcome of step e is true examining whether the cache memory comprises sufficient space for storing the said data unit (step S13),

eaa if the outcome of step ea is true then loading said data unit into said space (step S14),

f reducing the reference priority value (S17),

g determining whether the reference priority value is greater than or equal to a bottom priority value (S18),

ga repeating steps d to g if the outcome of step g is true.

10. Device for recording a record carrier (1) comprising information organized in a plurality of files containing audio visual data (11) and playback control data (12) for controlling playback of the audiovisual data on a playback device while enabling user interaction, the information further comprising priority information (priority), indicating the relative priority with which the files are to be stored in a cache memory (39) of the playback device,
the playback device comprising
means for obtaining the audiovisual data,
means for composing the control data,
priority determining means for determining the priority information,
formatting means for formatting the audiovisual data and the control data into files,
recording means for recording the information comprising the priority information, the audiovisual data and the control data at the record carrier.

11. Method for recording a record carrier (1) comprising information organized in a plurality of files containing audio visual data (11) and playback control data (12) for controlling playback of the audiovisual data on a playback device while enabling user interaction, the information further comprising priority information (priority), indicating the relative priority with which the files are to be stored in a cache memory (39) of the playback device,
the method comprising the steps of
- obtaining the audiovisual data,
- composing the control data,
- determining the priority information,
- formatting the audiovisual data and the control data into files,
- storing the information comprising the priority information, the audiovisual data and the control data at the record carrier.

ABSTRACT:

A record carrier (1) according to the invention comprises information organized in a plurality of files containing audio visual data (11) and playback control data (12) for controlling playback of the audiovisual data on a playback device while enabling user interaction. The information further comprises priority information (priority), indicating the relative priority with which the files are to be stored in a cache memory (39) of the playback device. The invention also relates to a device for playing back a record carrier and a method for playing back a record carrier.

Fig. 1

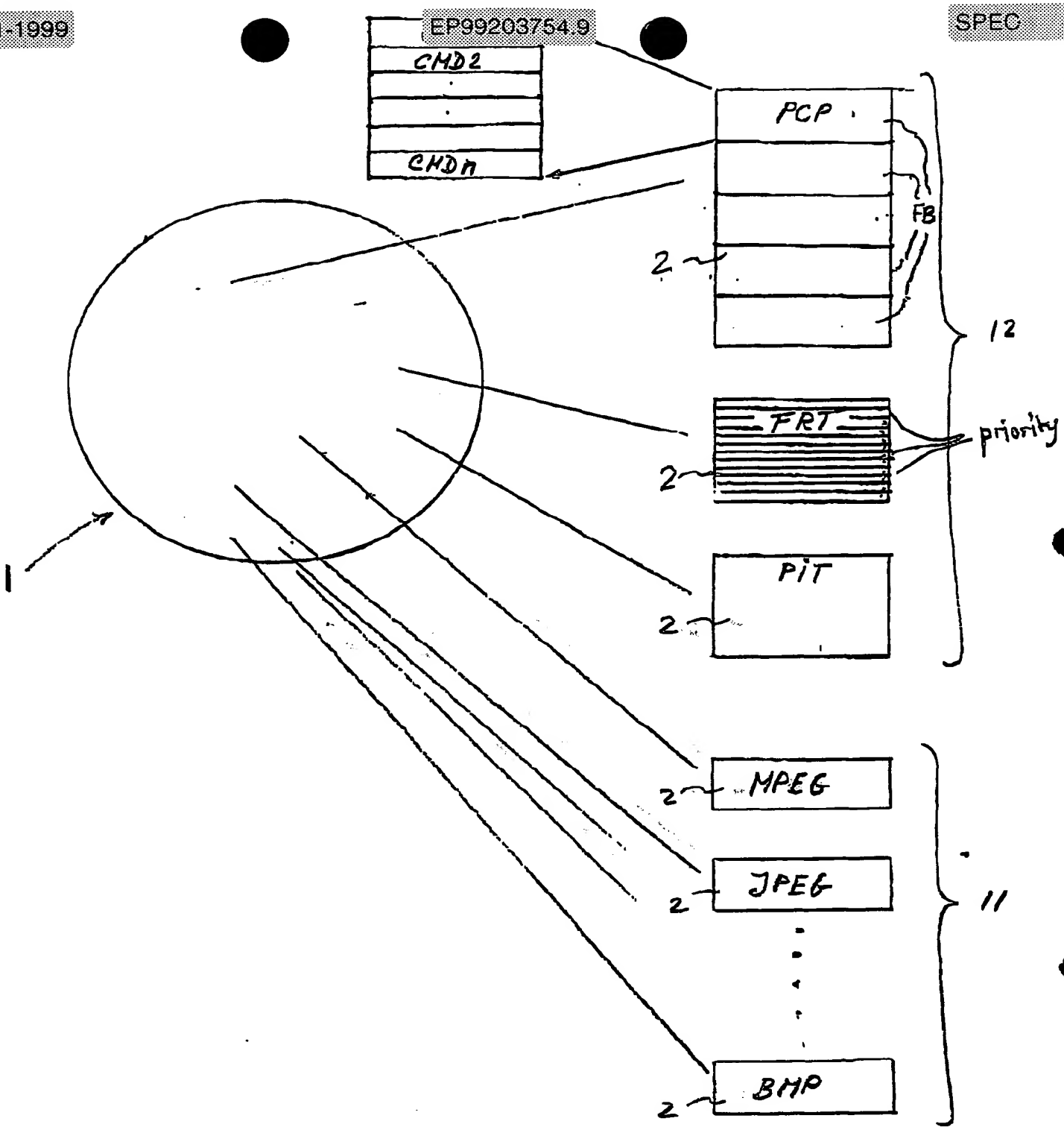

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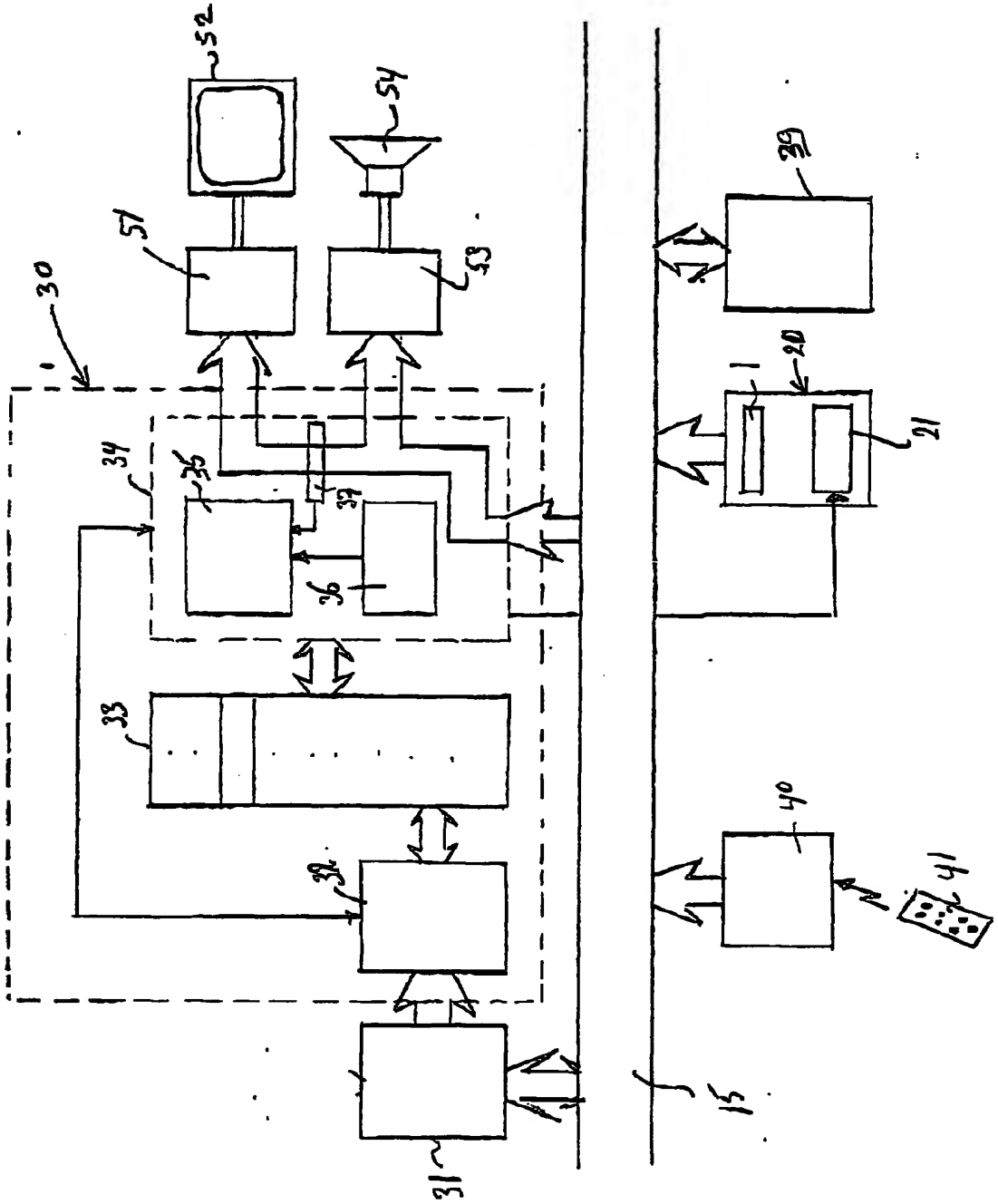
Fig. 1

Fig 2



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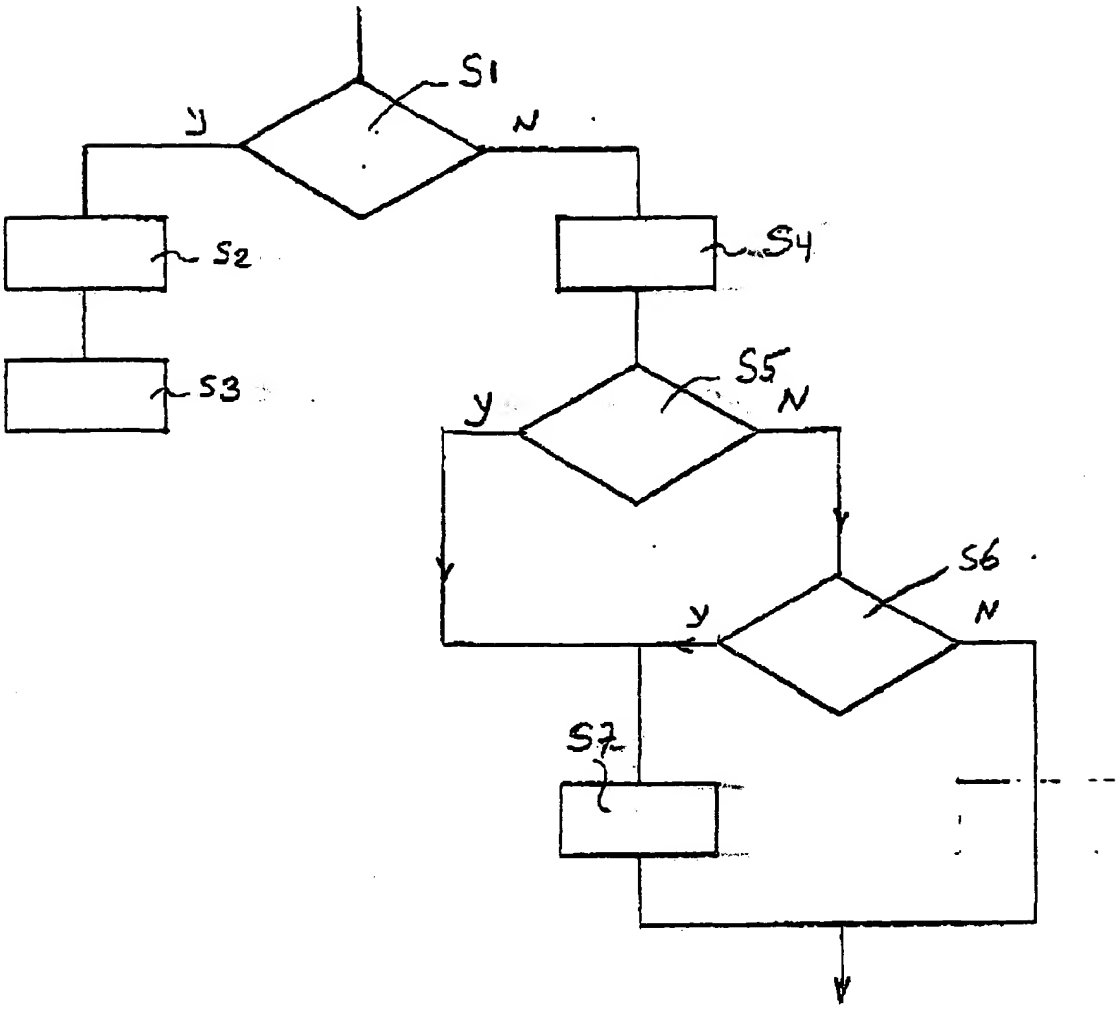
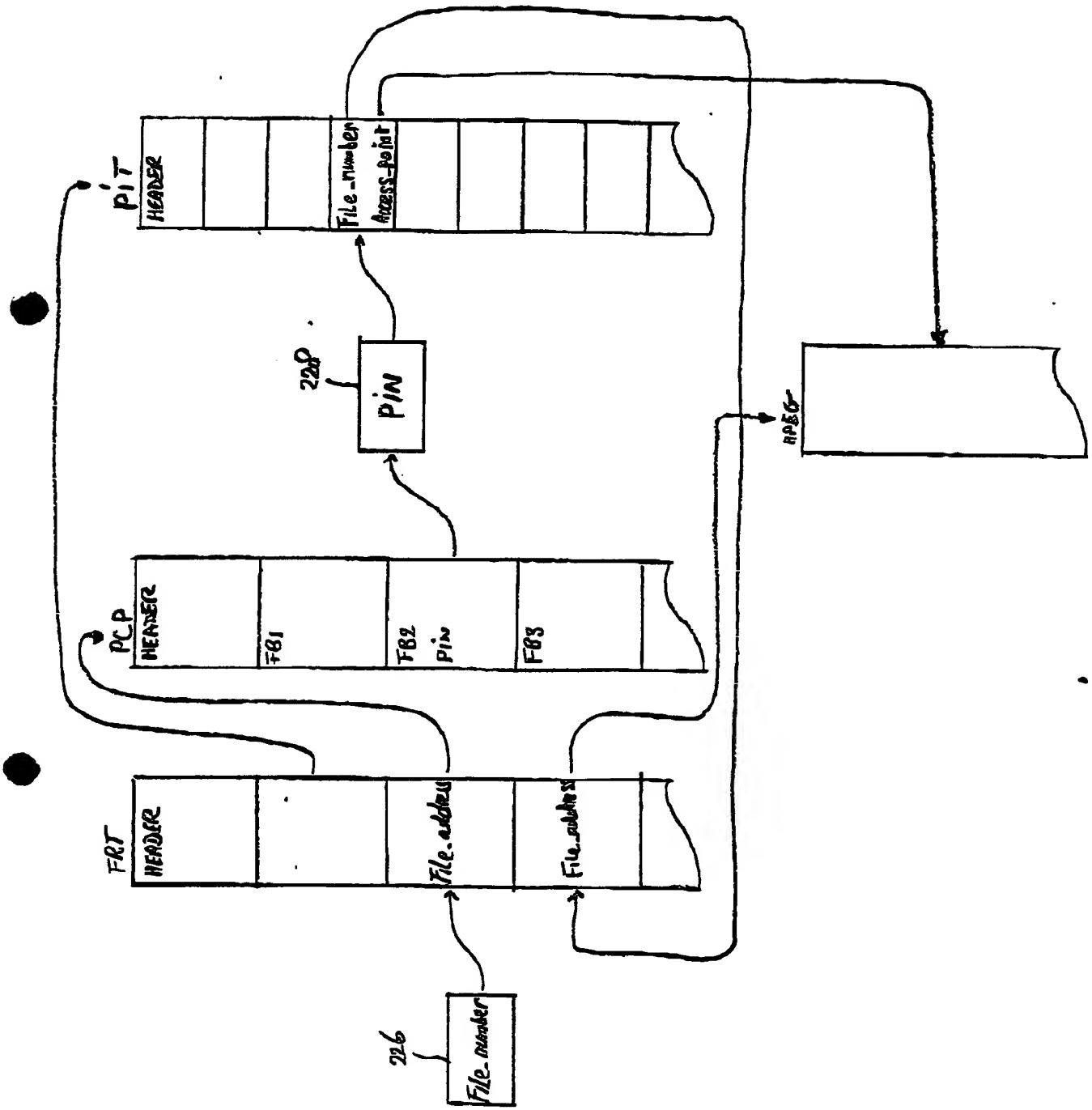


Fig 3.

Fig 4



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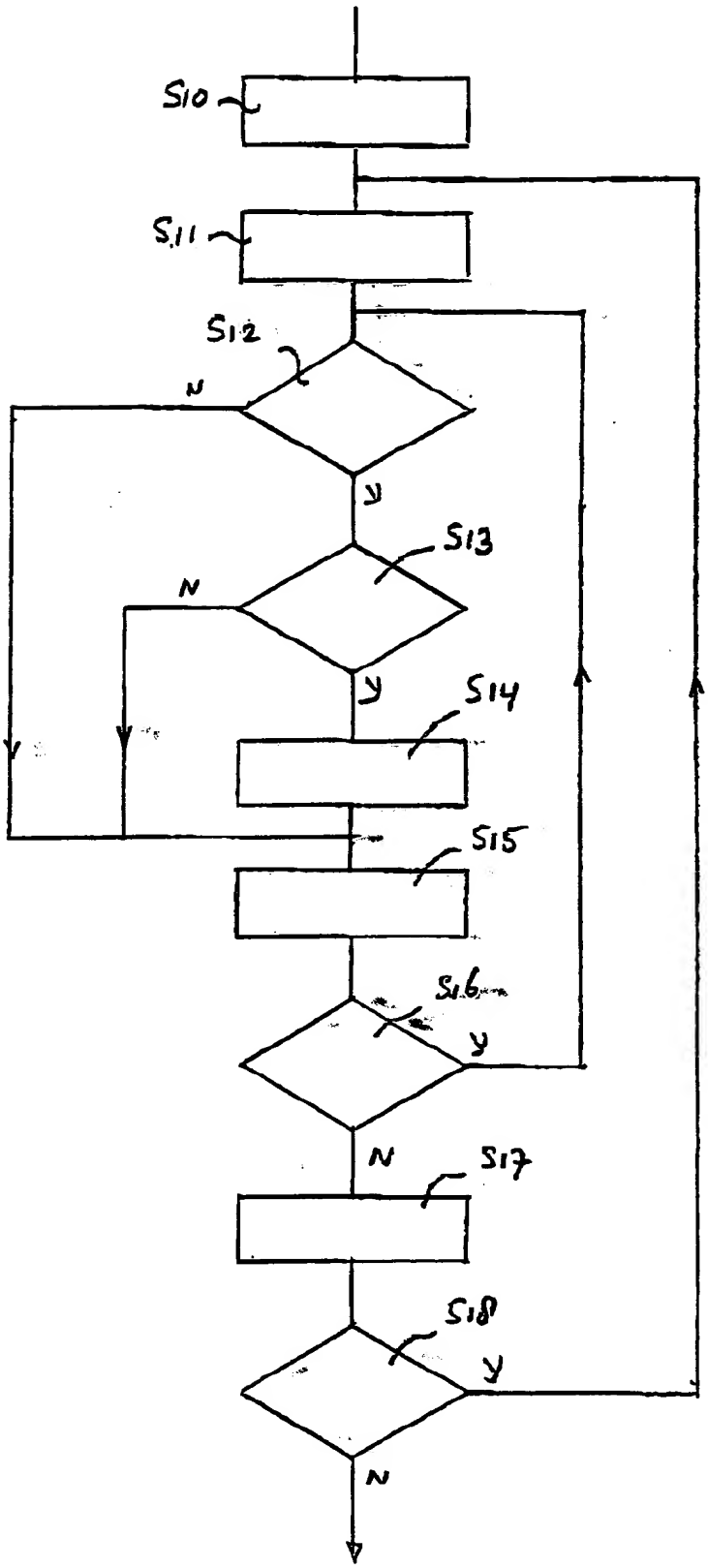

Fig. 5.

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